Prevalence of acute respiratory infection among under-five children in urban and rural areas of puducherry, India

Ganesh Kumar S, Anindo Majumdar, Veera Kumar, Bijay Nanda Naik, Kalaiselvi Selvaraj, Karthik Balajee

Department of Preventive and Social Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research JIPMER, Puducherry, India

Address for correspondence:
Dr. Ganesh Kumar S, Department of Preventive and Social Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry - 06, India.
E mail- sssgan@yahoo.com

Abstract

Introduction: The incidence of Acute respiratory infections (ARI) is high among under-five children, especially in developing countries. However, the data on ARI from rural and urban areas in India are scarce. **Objective:** To estimate the prevalence of ARI and selected associated factors among under-five children. **Materials and Methods:** A community-based cross-sectional study was conducted in urban and rural areas of Puducherry, India. Data were collected from 509 parents of under-five children regarding ARI incidence along with socio-demographic and selected associated factors. **Results:** Overall prevalence of ARI was observed to be 59.1%, with prevalence in urban and rural areas being 63.7% and 53.7%, respectively. Bivariate analysis indicated that overcrowding, place of residence, and mother's education were significantly associated with ARI. Multiple logistic regression analysis suggested that presence of overcrowding (adjusted odds ratio [AOR] = 1.492), urban residence (AOR = 2.329), and second birth order (AOR = 0.371) were significant predictors of ARI. **Conclusion:** The prevalence of ARI is high, particularly in urban areas. Improvement of living conditions may help in reduction of burden of ARI in the community.

Key words: ARI, under-5 years old children, rural, urban, respiratory disease

INTRODUCTION

Acute respiratory infection (ARI) is the major cause of mortality among children aged less than 5 years, especially in developing countries like India.[1,2] Lower respiratory tract infections (LRTIs) are the leading cause of under-five morbidity globally.[3]

ARI poses a major challenge to the health system in developing countries because of high morbidity and mortality.[4] It is estimated that Bangladesh, India, Indonesia, and Nepal together account for 40% of the global ARI mortality. Interestingly infants living in overcrowded surroundings and suboptimally breast-fed are more likely to suffer ARI-related illnesses.[5,6]

In India, ARI accounts for 30-50% of visits to health facilities and 20-40% of hospital admissions.[7] In urban slum areas, ARI constitutes over two-thirds of all childhood illnesses.[8] Despite these statistics, majority of the reported evidences underestimate the actual burden of ARI in the community. Hence, continued understanding of ARI prevalence and associated risk factors is essential. However, estimating the morbidity burden has inherent challenges due to lack of uniformity in study definitions, spectral nature of illness and misclassification errors.[1] Hence, this study was conducted to estimate the prevalence of ARI among under-five children residing in urban and rural communities of Puducherry, India and to identify the association between ARI and selected socio-demographic and environmental factors.

Access this article online	
Quick Response Code:	Website: www.jnsbm.org
	DOI: 10.4103/0976-9668.149069

MATERIALS AND METHODS

A community-based cross-sectional study was conducted during October 2013 to February 2014 in the field practice areas of Urban Health Centre (UHC; population of 9000) and Rural Health Centre (RHC; population of 8507) attached to a medical college in Puducherry, India.

Sample size estimation and sampling technique

Considering a prevalence of 42.3%[9] and absolute precision of 7%, the sample size was calculated to be 199. Considering a refusal rate of 10%, final minimum sample size required from each urban and rural area was estimated to be 219. To achieve this, two out of four urban areas and three out of four villages from rural areas were selected randomly by lottery method. Purposive sampling was adopted to select the sample of children from the respective areas. Children aged less than 5 years with parents living in the field practice area for at least 6 months were included in the study.

Method of data collection

The study was conducted by house-to-house survey by the investigators and medical interns. The medical interns were trained and supervised in data collection process. Informed consent was obtained from the informants before the initiation of data collection. Data was collected by interview technique from the mother of the child. If mother was not present at the time of house visit, the father was interviewed. If within the same household, more than one child were present, one of them were selected randomly in the study. Information on ARI episode and certain associated factors were obtained using a pretested semi-structured questionnaire.

In the present study, the operational definition of an ARI episode used was based on a child having at least one of the following recognizable symptoms of ARI (cough, runny nose, ear discharge, and sore throat, which might be associated with fever, chest retractions, and fast breathing) within the last 2 weeks of the visit. With the help of the pretested interview schedule, information regarding socio-demographic characteristics of the mother and child and associated factors such as overcrowding, birth order, birth weight, number of siblings, duration of exclusive breast feeding, and duration of total breast feeding were documented. Overcrowding was assessed based on the number of persons and living rooms.

Statistical analysis

Data was analyzed using SPSS (Statistical Package for Social Sciences) software version 17.0. Bivariate analysis was performed to assess the risk factors associated with ARI. Multivariate analysis was performed using logistic regression analysis to identify association of ARI and suspected risk factors after adjusting for other confounding factors. Results of multivariate analysis were reported as adjusted odds ratios (AOR) with 95% confidence interval (CI).

RESULTS

A total of 509 subjects participated in the study. Among them, 278 (54.6%) and 231(45.4%) were from urban and rural areas, respectively. Overall prevalence of ARI was observed to be 59.1% (301/509). Children from urban areas (63.7%) had higher prevalence of ARI compared with children living in rural areas (53.7%). Running nose and cough were the most common symptoms of ARI reported [Table 1].

The prevalence of ARI was highest in age group 0-12 months (63.2%), followed by 25-60 months (59.5%), and was comparatively lower in 13-24 months age group (52.6%). Higher proportions of boys (62.9%) were reported to have ARI as compared with girls (55.1%). Incidentally ARI prevalence was higher among children born with a birth weight of <2.5 kg, had mother's educated between 1st and 7th class, had two or more siblings, and those who lived in overcrowded settings. Bivariate analysis indicated overcrowding, place of residence and mother's education as significant risk factors associated with ARI [Table 2].

Multiple logistic regression analysis suggested that presence of overcrowding (AOR = 1.492), urban place of residence (AOR = 2.329), and second birth order (AOR = 0.371) were significant predictors of ARI [Table 3].

DISCUSSION

In our study, the overall prevalence of ARI was higher than similar studies from Delhi,[10] rural Ahmadabad,[11] and Assam[12] in India. Surprisingly, a recent National Family Health Survey (NFHS-3) data suggests a 5.8% prevalence rate.[1] Such differences in prevalence rates may be due to the difference in cultural and socio-economic factors present in different

Table 1: Symptoms of ARI among under-five children (*N* = 509)

Symptoms	Number of subjects (%)
Cold/running nose	268 (52.7)
Cough	231 (45.4)
Sore throat	17 (3.3)
Ear discharge	6 (1.2)
Any of the above symptom	301 (59.1)
Associated with fever	143/301 (47.5)
Associated with fever and fast breathing	6/301 (2.0)

Table 2: Factors associated with ARI among under-five children (*N* = 509)

Variable	Categories	Total number of subjects	Number of subjects with ARI (%)	Pearson chi-square value	*P* value
Age in months	0-12	133	84 (63.2)	2.632	0.268
	13-24	97	51 (52.6)		
	25-60	279	166 (59.5)		
Gender	Male	264	166 (62.9)	3.180	0.075
	Female	245	135 (55.1)		
Place of residence	Urban	278	177 (63.7)	5.210	0.022*
	Rural	231	124 (53.7)		
Overcrowding	Yes	200	139 (69.5)	14.645	0.000*
	No	309	162 (52.4)		
Birth weight	<2.5 kg	204	123 (60.3)	0.189	0.664
	≥2.5 kg	305	178 (58.4)		
Mother's education	Illiterate	20	9 (45.0)	7.103	0.029*
	1-7th class	471	286 (60.7)		
	≥7th class	18	6 (33.3)		
Number of siblings	0	159	99 (62.3)	3.403	0.182
	1	277	154 (55.6)		
	≥2	73	48 (65.8)		
Birth order	1	269	150 (55.8)	3.055	0.217
	2	204	130 (63.7)		
	≥3	36	21 (58.3)		
Duration of total breast feeding in children more than 18 months of age (*N*=371)	<6 months	29	17 (58.6)	0.245	0.885
	6-18 months	247	145 (58.7)		
	>18 months	95	53 (55.8)		
Exclusive breast feeding for children aged 6 months and more (*N*=451)	Yes	392	231 (58.9)	0.093	0.761
	No	59	36 (61.0)		

**P* value less than 0.05 was considered as significant.

Table 3: Associated factors of ARI: Multiple logistic regression analysis

Variable	Category	Adjusted odds ratio (95% CI)	*P* value
Age group in months	0-12	1.024 (0.632-1.657)	0.924
	13-24	1.276 (0.772-2.110)	0.342
	25-60	–	
Gender	Male	0.695 (0.478-1.011)	0.057
	Female	–	
Overcrowding	Yes	2.329 (1.541-3.518)	0.000*
	No	–	
Area of residence	Urban	1.492 (1.017-2.190)	0.041*
	Rural	–	
Birth weight	≥2.5 kg	0.917 (0.624-1.349)	0.661
	<2.5 kg	–	
Mothers education	Illiterate	0.830 (0.193-3.570)	0.830
	1-7th class	0.467 (0.155-1.407)	0.467
	≥7th class	–	
Number of siblings	0	0.854 (0.358-2.037)	0.722
	1	1.870 (0.879-3.971)	0.104
	≥2	–	
Birth order	1	0.745 (0.275-2.016)	0.562
	2	0.371 (0.138-0.996)	0.049*
	≥3	–	

**P* value less than 0.05 was considered as significant.

geographical regions, difference in risk factor exposure and methodology adopted in the study. Interestingly, a study conducted in a rural community in Bangladesh reported 58.7% prevalence rate of ARI, which is comparable to this study.[13]

A study using 4-5 years age group reported 47.3% prevalence rate of ARI.[11] In contrast, we observed a higher prevalence of ARI among infants. A community-based study in a coastal village of Karnataka, India reported the incidence of pneumonia to be significantly higher among infants.[14] An epidemiological study conducted in an urban area of West Tripura, India also reported higher incidence of pneumonia among infants.[15] In our study, although more boys were affected from ARI than girls, this data was not statistically significant and is consistent with other reports.[12,13,16] Our study indicated a significant association of overcrowding with ARI, which is consistent with other studies.[5,11,13] However, only a limited number of studies from India have compared the prevalence of ARI in urban and rural areas. The higher prevalence of ARI in the urban areas compared with rural areas and in overcrowded settings stresses the fact that ARI control programs in India need to consider these risk factors while treating ARI in urban primary care settings.

One of the limitations of the study was convenient sampling used in selection of urban and rural areas. Due to diversity of population in different parts of India and their living conditions, it is difficult to generalize these findings. Further, quantification of certain other related risk variables could not be included in our study due to feasibility constraints. Since our study was performed in a shorter duration, effect of seasonality could not be studied. Nevertheless further longitudinal multi-centric studies in urban and rural areas will help in identifying the time trend analysis of ARI and its association with risk factors.

CONCLUSION

ARI is an important public health problem among under-five children. Improvement of living conditions in houses may help in reduction of ARI among under-five children in the community.

ACKNOWLEDGMENT

The authors thank the interns who helped in data collection process. The authors also thank the concerned families who participated in the study.

REFERENCES

1. Selvaraj K, Chinnakali P, Majumdar A, Krishnan IS. Acute respiratory infections among under-5 children in India: A situational analysis. J Nat Sci Biol Med 2014;5:15-20.
2. Management of childhood illness in developing countries-rationale for an integrated strategy, World Health Organization (WHO) Geneva: WHO and UNICEF; 1998.
3. Klugman KP, Madhi SA. Acute Respiratory Infections. International Bank for Reconstruction and Development. London: The World Bank; 2006.
4. Frese T, Klauss S, Herrmann K, Sandholzer H. Children and adolescents as patients in general practice - the reasons for encounter. J Clin Med Res 2011;3:177-82.
5. Mathew JL, Patwari AK, Gupta P, Shah D, Gera T, Gogia S, *et al*. Acute respiratory infection and pneumonia in India: A systematic review of literature for advocacy and action: UNICEF-PHFI series on newborn and child health, India. Indian Pediatr 2011;48:191-218.
6. Dhimal M, Dhakal P, Shrestha N, Baral K, Maskey M. Environmental burden of acute respiratory infection and pneumonia due to indoor smoke in Dhading. J Nepal Heal Res Counc 2010;8:1-4.
7. Vashishtha VM. Current status of tuberculosis and acute respiratory infections in India: Much more needs to be done! Indian Pediatr 2010;47:88-9.
8. Rahman MM, Shahidullah M. Risk factors for acute respiratory infections among the slum infants of Dhaka city. Bangladesh Med Res Counc Bull 2001;27:55-62.
9. Kaushik PV, Singh JV, Bhatnagar M, Garg SK, Chopra H. Nutritional correlates of acute respiratory infections. Indian J Matern Child Health 1995;6:71-2.
10. Gupta N, Jain SK, Ratnesh, Chawla U, Hossain S, Venkatesh S. An evaluation of diarrheal diseases and acute respiratory infections control programmes in a Delhi slum. Indian J Pediatr 2007;74:471-6.
11. Pajapti B, Talsania N, Sonaliya KN. A study on prevalence of acute respiratory tract infections (ARI) in under-five children in urban and rural communities of Ahmedabad district, Gujarat. Natl J Community Med 2011;2:255-9.
12. Islam F, Sarma R, Debroy A, Kar S, Pal R. Profiling acute respiratory tract infections in children from Assam, India. J Global Infect Dis 2013;5:8-14.
13. Rahman MM, Rahman AM. Prevalence of acute respiratory tract infection and its risk factors in under-five children. Bangladesh Med Res Counc Bull 1997;23:47-50.
14. Acharya D, Prasanna KS, Nair S, Rao RS. Acute respiratory infections in children: A community based longitudinal study in south India. Indian J Public Health 2003;47:7-13.
15. Deb SK. Acute respiratory disease survey in Tripura in case of children below five years of age. J Indian Med Assoc 1998;96:111-6.
16. Broor S, Pandey RM, Ghosh M, Maitreyi RS, Lodha R, Singhal T, *et al*. Risk factors for severe acute lower respiratory tract infection in under-five children. Indian Pediatr 2001;38:1361-9.

How to cite this article: Kumar SG, Majumdar A, Kumar V, Naik BN, Selvaraj K, Balajee K. Prevalence of acute respiratory infection among under-five children in urban and rural areas of puducherry, India. J Nat Sc Biol Med 2015;6:3-6.

Source of Support: Nil. **Conflict of Interest:** None declared.